AGNPS Watershed Modeling with GIS Databases

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We used geospatial databases built with geographic information systems (GIS) as primary sources of input data to the Agricultural Non-Point Source (AGNPS) pollution computer model of watershed hydrology. Elevation, land cover, and soils for four watersheds are the base from which the 22 input parameters required by the AGNPS were extracted. Our effort provides an example of automatic extraction of the AGNPS input parameters from high resolution GIS databases to investigate improved accuracy of the water-quality model results.

The four watersheds used include the Little River and Piscola Creek, Georgia; Sugar Creek, Indiana; and EL68D Wasteway, Washington. Watershed boundaries were established from the National Water-Quality Assessment (NAWQA) Program. A second set of boundaries was extracted from USGS Digital Elevation Models (DEMs). This boundary extraction was performed with the GIS Weasel, an internally developed USGS program that interfaces GIS software with several water models in the Modular Modeling System.

USGS 30 m DEMs and the 30 m, Multi-Resolution Land Characteristics land cover data were used as the base for the extraction processes. These elevation and land cover data were augmented with recent (1997 and 2001) land cover extractions from Landsat Thematic Mapper and a set of high resolution (3 m) data to determine resolution effects. The soils databases were derived from U. S. Department of Agriculture (USDA) soil surveys by scanning mylar separates of soil polygons, then rectifying, vectorizing, and tagging the resulting digital data. Soils data were resampled to the 30 m and 3 m base resolutions. To assess the effects of resolution on model results, the 30 m raster data were resampled to 60, 120, 210, 240, 480, 960, and 1920 m resolution. The 210 m database roughly matches the 10-acre grid size commonly used by the USDA.

The requisite 22 AGNPS parameters were extracted from the three primary databases utilizing object-oriented programming and macro languages. The ERDAS Imagine software was the primary tool used for manipulating the raster GIS databases. The extracted parameters were processed with the event-based AGNPS model (version 5.0) for each of the watershed resolutions and for the two different watershed boundaries from NAWQA and Weasel. The output was inspected in the AGNPS standard output tabular/numerical form. In addition, we created graphical output for each model run by generating a series of multi-dimensional images from

the numerical AGNPS output for each data resolution and model run. Collaboration continues between geographers, computer programmers, hydrologists, and hydraulic engineers to quantify the impact of geospatial resolution on model results.